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Some Considerations Affecting the Size of Industrial Plants

A SYMPOSIUM

THE determination of the correct size for an industrial plant is a question which is affected by a larger number of variables than almost any other which the manufacturer must meet. An answer to this question which would meet the widely varying conditions encountered in American industry would be difficult to secure from any one source. In order to make the treatment of this subject as suggestive as possible we have secured short informal opinions from several manufacturers in widely different lines who have been forced to cope with this problem in large sized undertakings. The fact that each of our collaborators has approached the subject from a different angle confirms the wisdom of this method of treatment.

Because in the past we have not been forced to observe such considerations as that there is a one best size for a manufacturing plant for each given set of conditions, is no argument for believing that we can ignore such factors in the future. The world's industrial methods and technique constantly seek common standards. These standards ever approach a closer harmony with their environment. Those who would excel—even survive—in the world's industrial competition must more and more study the philosophical bases of industry. This question of size then must interest every individual manufacturer, but its importance as a factor in international industrial competition is paramount. Approached from this angle of national—as opposed to purely local—interests many of the efforts made by Chambers of Commerce and Boards of Trade to promote the establishment of manufacturing plants in a given locality do not make for absolute progress. The question of the proper size for efficient operation hardly ever comes up. The days for this frontier type of industrial development are numbered. More and more we must scheme out our industry so as to be able to produce a given unit with the least possible expenditure of human effort and natural resource.

Contributed by JOSEPH W. POWELL, Vice-President, Bethlehem Ship-building Corporation, Ltd., South Bethlehem, Pa.

THE proper size for a manufacturing establishment is an extremely difficult question and one that is not susceptible of any very definite reply. This subject naturally divides itself into consideration of problems of

- 1—Management
- 2—Finance
- 3—Sales
- 4—Purchase
- 5—Production

From the standpoint of management, a small manufacturing establishment under the leadership of a highly efficient head will make a fine showing under given conditions. A large establishment in the business with a weak organization will make an extremely poor showing. The evident advantage of a small business in efficient hands is the ability of the directing mind to be thoroughly familiar with and to supervise all its details. In a large organization the specialization that is possible should permit better ability in each of the various departments into which the business is organized than could possibly be combined in any single person. Moreover, the larger organization is usually better able to offer attractive opportunities to the individual, with a corresponding ability to command the best brains in any particular line.

The efficient larger company will generally be able to handle all questions of finance in a more satisfactory and economical way than the smaller company. It is in position to take advantage of general business conditions in its borrowings and in its credits, and also should have a better grasp of the general situation.

In its sales of its product and in its distribution, it is possible for the large company to have an organization covering a field that the small company cannot hope to cover, which is an evident advantage in stabilizing its business over periods of depression that are never equally severe in different areas. The ability of the large company to carry stocks is often a large factor in obtaining business where early delivery is of importance.

On the side of its purchases a large organization has a distinct advantage. From its nature it can evidently command a much

wider knowledge of the probable future of the markets than the smaller company, and by purchasing in quantity and for the most advantageous periods, can demand and obtain concessions as to prices that a smaller company can seldom equal.

In connection with production in a smaller establishment, the direct personal contact with employes in an efficient organization is undoubtedly of very great value. It is evident that the most efficient small manufacturing establishment should show better results than the average efficiency that will ever be obtained in any large establishment. On the other hand, recent developments of representative bodies of employes and employers to bring both ends of the business into closer contact is doing a great deal to achieve a substitute for the older personal relations that could exist in smaller concerns. The far greater specialization that is possible in production under a large establishment is a considerable offset.

Generally speaking, any business large or small will become unwieldy if not efficiently managed. On the other hand, very great size is possible without serious loss of efficiency under effective management. That the tendency to "red tape" increases with size is axiomatic, but the splendid commercial results achieved by some of the largest organizations are the best proof that the benefits that come with size offset its disadvantages.

I believe there is today a field for a small as well as for a large manufacturing concern in almost any line. A small concern by achieving the maximum of efficiency will, on the average, work well within the limits that mean commercial success; while the large concern with almost no limit as to size, under proper management, will achieve similarly splendid results from the standpoint of the public, the employes and the stockholders.

Contributed by H. H. TITSWORTH, Chairman of the Board, Clay Products Co., Indianapolis, Ind.

IT would be very interesting to know how many manufacturers per thousand have preserved manufacturing units at the same size as originally built. The length of the list would no doubt compare most favorably with that of republican senators in full favor of the League of Nations.

Let us assume that seven operations is a fair average per plant; this particular number being selected from one industry for the sake of illustration, although any other would do as well. Mr. Average Manufacturer, after proper engineering and other advice, arranges a layout which permits the handling of his materials through these various processes with a minimum of time, labor and space. The layout, of course, shows marked variations in space and arrangement due to the special needs of each process.

The plant is placed in operation, and after the customary period of adjustment fulfills the reasonable hopes of its designers, and functions as a unit.

Two years go by. The newness begins to wear off. Business shows increase, and the sales curve jumps away from that of production. Pressure for production increase falls first upon the executive in charge of plants, coming of course from the manager of sales. The superintendent of the plant gets an inkling of the situation and prepares for the conference that he knows is coming, by gathering statistical information on the various processes to show the weak point in production. The argument that the plant was originally built as a balanced unit is old to him, and he shows the opportunity for a ten per cent increase in some one process, by space enlargement and the necessary changes in subsequent operations by machinery rearrangement and double shift labor only.

The plan is turned down cold by the management, and every one assumes that the *status quo ante* is as solid as ever. A year later, however, the sales organization meets unusual success in opening up new fields for the same old products, but deliveries on orders in prospect cannot be promised at dates satisfactory to the jealously guarded reputation for service, which the house has always maintained. The conferences of the sales manager, the superintendent and the plant executive result differently this time, on account of the unusual profit apparent in the new business offered, and the plant executive gives his reluctant promise to bring the matter before the president and the directors, who consent to the proposed enlargement.

The damage is done. That plant presents, after the first alteration is completed, one struggle after another to get back to the balance of the unit as originally planned, and never succeeds.

The balance is gone. The "point of saturation" of labor, or of space, or of process speed has been passed, and costs rise above the original figure.

It is doubtful if there is a corporation of any size that has manufactured over a period of years that has not gone through this experience. Until the lesson has been learned that there is almost invariably an immediate rise in costs by physical change in the unit originally laid out with balanced processes, and that there is but rarely secured an increase in output commensurate to the cost of the plant additions, Mr. Average Manufacturer will not see the full merchandising problem before him. The curves of sales and production can merge again only by not attempting to market more than the original unit was designed to manufacture, or by the erection of a new unit, balanced like the old.

There are countless other advantages to be secured by the last arrangement, among them possible reduction in number of products made in each unit, new labor markets from the new location, savings in freight to points of distribution, opportunities for the installation of newer manufacturing methods, and valuable comparisons. The successful operation of one or many units, balanced at time of their erection offers to Mr. Average Manufacturer who has been fortunate enough to live through the period in which he secures his own experience on this subject, two alternatives only, content with present output or new unit erection. He has learned that the middle course does not succeed.